CLAIMS

What is claimed is:

1. An optical system, comprising:

a first branch capable of allowing light to pass therethrough in a forward direction and a reverse direction, the first branch including a first medium with a first refractive index (n_1) and including a first end and a second end;

a second branch capable of allowing light to pass therethrough in the forward direction, the second branch including a second medium with a second refractive index (n_2) and including a first end and a second end, the second end of the second branch coupled to the first branch to form an angle (ϑ_2), any light passing in the reverse direction from the first branch to the second branch forming an incident angle (ϑ_1);

wherein $n_2 < n_1$ and $\vartheta_1 \geq \sin^{-1}(n_2 / n_1)$ to prevent the light passing through the first branch in the reverse direction from passing into the second branch.

2. The optical system of claim 1, wherein the first branch and the second branch are components of a Y-junction.

3. The optical system of claim 1, wherein the first branch and the second branch are components of a K-junction.

4. The optical system of claim 1, wherein the first branch and the second branch are components of an X-junction.

5. The optical system of claim 1, wherein the first branch includes an optical absorber for absorbing the light passing in the reverse direction that is prevented from passing into the second branch.

6. The optical system of claim 1, wherein isolation provided between the first branch and the second branch is polarization independent.

7. The optical system of claim 1, wherein a numerical aperture of one of the ends of one of the branches is lowered for increasing isolation.

8. The optical system of claim 1, wherein a transmitting area of one of the branches is decreased for increasing isolation.

9. The optical system of claim 1, wherein an optical choker is positioned at one of the ends of the first branch for increasing isolation.

10. The optical system of claim 1, wherein an optical choker is positioned at one of the ends of the second branch for increasing isolation.

11. The optical system of claim 1, wherein the optical system functions as an optical isolator.

12. The optical system of claim 1, wherein the optical system functions as an optical attenuator.

13. The optical system of claim 1, wherein the first branch and the second branch have a substantially rectangular cross-section.

14. The optical system of claim 1, wherein the first branch and the second branch are components of a first optical isolator, and further comprising a second optical isolator integrated with the first optical isolator.

15. The optical system of claim 14, wherein an optical coupler is formed.

16. The optical system of claim 15, wherein the optical coupler functions as an add-multiplexer.

17. The optical system of claim 15, wherein the optical coupler functions as a polarization beam combiner.

18. The optical system of claim 15, wherein the optical coupler functions as an optical inserter.

19. The optical system of claim 14, wherein the first optical isolator and the second optical isolator are integrated with a third optical isolator to form an optical circulator.

20. The optical system of claim 15, wherein a Y-splitter added to the optical coupler forms an NxM optical coupler.

21. The optical system of claim 1, wherein a polarizer is formed.

22. The optical system of claim 11, and further comprising a wavelength selector coupled to the optical isolator to form a de-multiplexer.

23. The optical system of claim 19, and further comprising a wavelength selector coupled to the circulator to form a de-multiplexer.

24. The optical system of claim 3, wherein an extra port is available for monitoring an output as well as for feedback control of the optical system.

25. The optical system of claim 4, wherein an extra port is available for monitoring an output as well as for feedback control of the optical system.

26. The optical system of claim 1, wherein the system includes at least one of a waveguide, an optical fiber, a micro-optic, and a photonic crystal.

27. A polarizer optical system, comprising:

a first branch capable of allowing light to pass therethrough in a forward direction and a reverse direction, the first branch including a first medium with a first refractive index (n_1) and including a first end and a second end;

a second branch capable of allowing light to pass therethrough in the forward direction, the second branch including a second medium with a second refractive index (n_2) and including a first end and a second end;

wherein the first branch and the second branch at least in part form a polarizer.

28. The optical system of claims 27, wherein the system includes at least one of a waveguide, an optical fiber, a micro-optic, and a photonic crystal.

29. An optical method, comprising:

passing light through a first branch capable of allowing the light to pass therethrough in a forward direction and a reverse direction, the first branch

including a first medium with a first refractive index (n_1) and including a first end and a second end;

passing light through a second branch capable of allowing the light to pass therethrough in the forward direction, the second branch including a second medium with a second refractive index (n_2) and including a first end and a second end, the second end of the second branch being coupled to the first branch to form an angle (ϑ_2), any light passing in the reverse direction from the first branch to the second branch forming an incident angle (ϑ_1);

wherein $n_2 < n_1$ and $\vartheta_1 \geq \sin^{-1}(n_2 / n_1)$ to prevent the light passing through the first branch in the reverse direction from passing into the second branch.

30. A computer program product for designing an optical system, comprising:

a first branch capable of allowing light to pass therethrough in a forward direction and a reverse direction, the first branch including a first medium with a first refractive index (n_1) and including a first end and a second end;

a second branch capable of allowing light to pass therethrough in the forward direction, the second branch including a second medium with a second refractive index (n_2) and including a first end and a second end, the second end of the second branch coupled to the first branch to form an angle (ϑ_2);

wherein the computer program operates for calculating parameters associated with the optical system, simulating the optical system, and optimizing the optical system.